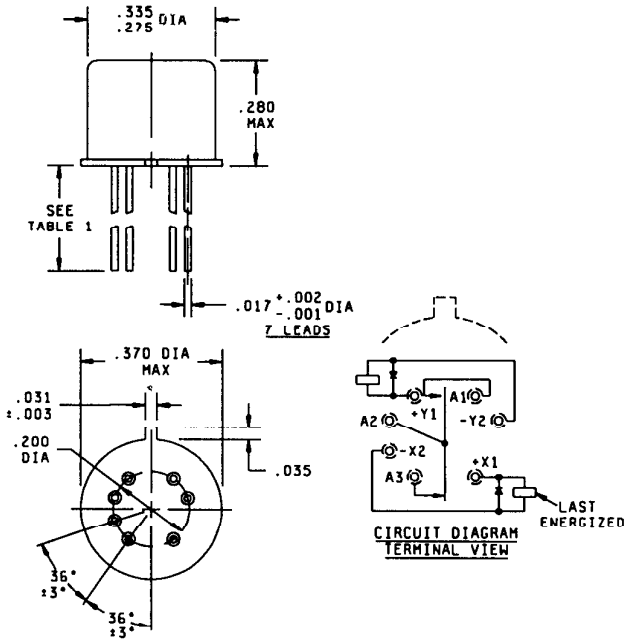
NOTE: The document identifier and heading has been changed on this page to reflect that this is a performance specification. There are no other changes to this document. The document identifier on subsequent pages has not been changed, but will be changed the next time this document is revised.

PERFORMANCE SPECIFICATION SHEET

RELAYS, ELECTROMAGNETIC, ESTABLISHED RELIABILITY, SPDT, LOW LEVEL TO 0.5 AMPERE (LATCHING) WITH INTERNAL DIODES FOR COIL TRANSIENT SUPPRESSION

This specification is approved for use by all Departments and Agencies of the Department of Defense.

The requirements for acquiring the product described herein shall consist of this specification and the latest issue of MIL-R-39016.

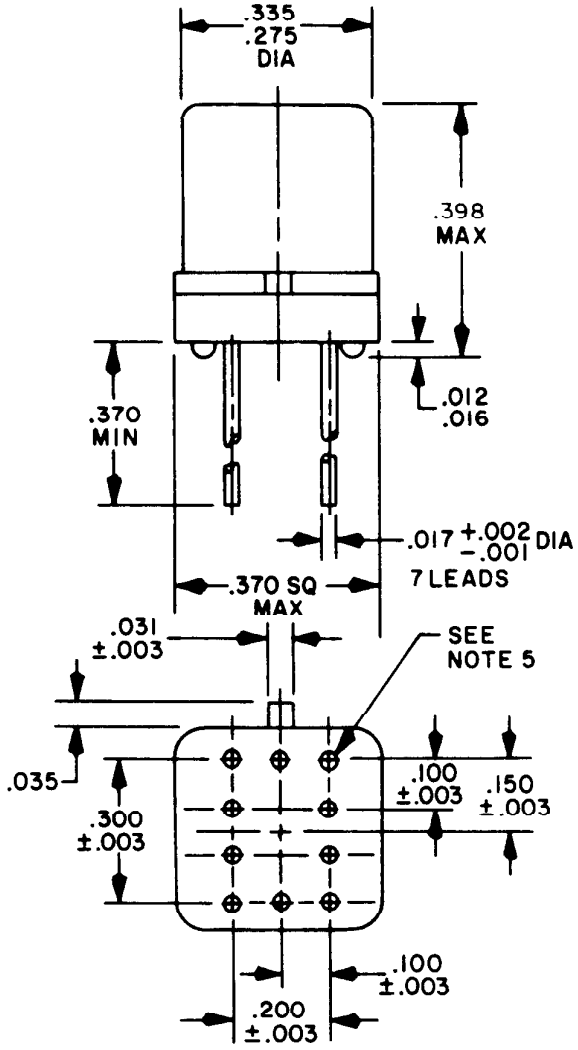


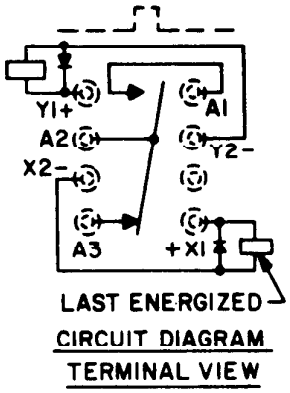
Inches	mm	Inches	mm	Inches	mm
.001	0.03	.031	0.79	.280	7.11
.002	0.05	.035	0.89	.335	8.51
.003	0.08	.200	5.09	.370	9.40
.017	0.43	.275	6.99		

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is ±.010 (0.25 mm).
4. Terminal numbers shown above are for reference only. Numbers do not appear on the relay.
5. Relays shall have a plus (+) sign placed on the circuit diagram as shown.
6. All leads shall be electrically insulated from the case.
7. Coil symbol optional in accordance with MIL-STD-1285.
8. Circuit diagram shown on part is the terminal view.

FIGURE 1. Dimensions and configuration.

(E) denotes changes





Inches	mm
.001	0.03
.002	0.05
.003	0.08
.012	0.30
.016	0.41
.017	0.43
.031	0.79
.035	0.89
.100	2.54
.150	3.81
.200	5.08
.275	6.99
.300	7.62
.335	8.51
.370	9.40
.398	10.11

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is ±.010 (0.25 mm).
Ⓔ 4. Spreader pads shall be certified to MIL-M-38527, M38527/05-003, or M38527/05-013.
5. Dimensions and tolerance shown for the bottom view of the spreader pad are for the center to center locations of the holes in the spreader pad.
6. Shape optional within the envelope dimension.
7. Terminal numbers shown above for reference only. Numbers do not appear on relay.
8. Relays shall have a (+) sign placed on circuit diagram as shown.
9. All leads shall be electrically insulated from the case.
10. Coil symbol optional in accordance with Mil-STD-1285.
11. Circuit diagram shown on part is the terminal view.

FIGURE 2. Dimensions and configuration relay with spreader pad attached.

REQUIREMENTS:

CONTACT DATA:

Load ratings:

High level (relay case grounded):

Resistive:
0.5 ampere at 28 V dc.
500 milliamperes at 115 V ac 400 Hz case not grounded.
250 milliamperes at 115 V ac 60 Hz case not grounded.
100 milliamperes at 115 V ac 60 Hz case grounded.

Inductive load: 0.2 ampere at 28 V dc with 0.32 henry inductance.

Lamp: 0.10 ampere at 28 V dc.

Low level: 10 to 50 µA at 10 to 50 mV dc or peak ac.

Intermediate current: Applicable.

Contact resistance or voltage drop:

(E) Initial: 0.125 ohm maximum (0.150 ohm maximum with spacer pad attached).

High level:

During life: Not more than 5 percent of open circuit voltage.

(E) After life: 0.225 ohm maximum (0.250 ohm maximum with spacer pad attached).

Low level:

During life: 33 ohms maximum.

(E) After life: 0.175 ohm maximum (0.200 ohm maximum with spacer pad attached).

Intermediate current:

During: 1 ohm maximum.

(E) After: 0.225 ohm maximum (0.250 ohm maximum with spacer pad attached).

Contact bounce: 1.5 milliseconds maximum (applicable to failure rate level "L").

Contact stabilization time: 2.0 milliseconds maximum (applicable to failure rate levels "M", "P", and "R").

Overload (high level only): Two times rated current.

(E) Neutral screen: Applicable.

COIL DATA: See table I.

Operate time: 1.5 ms maximum over temperature range with rated coil voltage.

Release time: Not applicable.

ELECTRICAL DATA:

Insulation resistance 1/: 10,000 megohms minimum at 500 V dc, except the resistance between coil and case at high temperature shall be 1,000 megohms minimum.

1/ Insulation resistance and dielectric withstanding voltage tests must always precede all other specified electrical measurements. Connect all coil terminals together to avoid damage to diodes.

Dielectric withstanding voltage: 1/

	Sea level V rms (60 Hz)	Altitude V rms (60 Hz)
Between case, frame, or enclosure and all contacts both in the energized and deenergized positions	500	
Between case, frame, or enclosure and coil(s)	500	125
Between all contacts and coil(s)	500	All terminals
Between open contacts in the energized and deenergized positions	500	to case
Between contact poles	500	
Between coils of dual coil relays	500	

(E) DIODE CHARACTERISTICS 2/:

Maximum transient voltage: 1 volt.

(E) Coil transient suppression: Applicable.

(E) Semiconductor in-process screening: Applicable, visual inspection of semiconductors shall be in accordance with MIL-STD-750, method 2073, or 2074.

ENVIRONMENTAL DATA:

Temperature range: -65°C to +125°C.

(E) Vibration (sinusoidal): MIL-STD-202, method 204. Contact chatter shall not exceed 10 microseconds maximum for closed contacts and 1 microsecond maximum closure for open contacts.

(E) Vibration (random): MIL-STD-202, method 214, test condition IG. Contact chatter shall not exceed 10 microseconds maximum for closed contacts, and 1 microsecond maximum closure for open contacts (applicable to qualification and group C testing only).

(E) Shock (specified pulse): MIL-STD-202, method 213, test condition B (75 g's). Contact chatter shall not exceed 10 microseconds maximum for closed contacts and 1 microsecond maximum closure for open contacts.

Magnetic interference: Applicable.

Resistance to soldering heat: Applicable.

Acceleration: Applicable.

Salt atmosphere (corrosion): In accordance with MIL-STD-750, method 1041.

PHYSICAL DATA:

Terminal strength, method 211, MIL-STD-202:

Pull test: Test condition A, 1 pound pull.
Bend test: Test condition C, 1/2 pound load.
(E) Twist test: As specified in MIL-R-39016.

1/ Insulation resistance and dielectric withstanding voltage tests must always precede all other specified electrical measurements. Connect all coil terminals together to avoid damage to diodes.
2/ WARNING: Reverse polarity on coil terminals will destroy diode.

Solderability: Applicable.

Dimensions and configuration: See figures 1 and 2.

Weight: 2.27 grams (0.08 ounce) maximum, 2.52 grams (0.089 ounce) maximum with spreader pad attached.

Seal: Hermetic.

(E) Minimum marking: Military part number "J" with the date code (example J8530), circuit diagram, manufacturers' name or source code.

LIFE TEST REQUIREMENTS:

High level: 100,000 cycles per relay.
(E) Low level: 100,000 cycles plus 900,000 cycles mechanical life.

PART NUMBER: M39016/27- (dash number from table I and suffix letter designating failure rate level).

(E) TABLE I. Dash number and characteristics. 1/ 2/

Dash numbers 3/				Coil voltage V dc 6/		Coil resistance ohms ±10%	At 25°C	At 125°C
Lead length 1.500 min 4/	Lead length .187 ±.010	Lead length .500 min	Spreader pad (figure 2) 5/	Rated	Max		Specified pickup (latch/reset) value (voltage) (V dc)	Specified pickup (latch/reset) value (voltage) (V dc)
013	019	025	031	5.0	5.8	61	2.8	3.7
014	020	026	032	6.0	8.0	125	3.5	4.5
015	021	027	033	9.0	12	280	5.3	6.8
016	022	028	034	12	16	500	7.0	9.0
017	023	029	035	18	24	1,130	10.5	13.5
018	024	030	036	26.5	32	2,000	14.2	18.0

1/ Each relay possesses high level and low level capabilities. However, relays previously tested or used above 10 mA resistive at 6 V dc maximum or peak ac open circuits not recommended for subsequent use in low level applications.

2/ WARNING: When latching relays are installed in equipment, the latch and reset coils should not be pulsed simultaneously. Coils should not be pulsed with less then the nominal coil voltage and the pulse width should be a minimum of *three times the specified operate time of the relay. If these conditions are* not followed, it is possible for the relay to be in the magnetically neutral position.

3/ The suffix letter L, M, P, or R to designate the applicable failure rate level shall be added to the applicable listed dash number. Failure rate level (percent per 10,000 cycles): L, 3.0; M, 1.0; P, 0.1; R, 0.01. Example, 013L - - - - - 036R.

4/ 1.500 leads are inactive for new design.

5/ Relays supplied with spreader pads (-031 through -036) shall have the pad rigidly attached.

6/ CAUTION: The use of any coil voltage less than the rated coil voltage will compromise the operation of the relay.

QUALIFICATION INSPECTION:

Qualification inspection and sample size: See table II.

Ⓔ TABLE II. Qualification inspection and sample size. 1/

Single submission		Group submission
18 units plus 1 open unit for level L at C = 0 2/ 33 units plus 1 open unit for level M at C = 0 2/ Qualification inspection as applicable	M39016/27-030	18 units plus 1 open unit for level L at C = 0 2/ 33 units plus 1 open unit for level M at C = 0 2/ Qualification inspection as applicable
	M39016/27-025 M39016/27-026 M39016/27-027 M39016/27-028 M39016/27-029	2 units each part number Qualification inspection, table, group II

1/ For retention of qualification or extension of qualification to lower failure rate levels, all life test data accumulated on MIL-R-39016/28 and MIL-R-39016/30 may be used in addition to MIL-R-39016/27 data. Prior to performance of retention of qualification, the relay manufacturer shall preselect the sampling plan.

2/ The number of units required for qualification testing will be increased as required in group V, table II, MIL-R-39016, if the relay manufacturer elects to test the number of units permitting one or more failures. Prior to performance of qualification testing, the relay manufacturer shall preselect the sampling plan.

Initial qualification of relays supplied with spreader pads (-031 through -036) shall be tested as specified below:

Perform the following tests as specified in the qualification inspection table of MIL-R-39016, in the order shown below:

Ⓔ Before installation of pad, screening, visual and mechanical inspection (internal), thermal shock, resistance to solvents, vibration (sinusoidal), vibration (random), shock (specified pulse), acceleration, terminal strength, magnetic interference (when specified), coil life (applicable to continuous duty relays only), resistance to soldering heat, salt spray (corrosion), overload (applicable to high level relays only), life, terminal strength, and intermediate current.

After installation of pad, perform the following tests as specified in the qualification inspection table of MIL-R-39016, in the order shown below:

Ⓔ Insulation resistance, dielectric withstanding voltage, static contact resistance, pickup voltage, hold voltage, dropout voltage, coil resistance, operate and release time, contact dynamic characteristics, coil transient suppression (when specified), solderability, seal, visual and mechanical inspection (external).

Qualification inspection (reduced testing for previously qualified relays) for relays supplied with mounting pads (-031 through -036) two units of the 26.5 volt rated coil voltage (-036) shall be tested as specified below:

Before installation of pad, perform the following tests as specified in the qualification inspection table of MIL-R-39016 in the order shown below:

For failure rate level L only: Screening.

Ⓔ For failure rate levels M, P, and R: Vibration (sinusoidal) test duration shall be 10 minutes, vibration (random) particle impact noise detection (P.I.N.D., when specified), screening.

After installation of pad, perform the following tests as specified in the qualification inspection table of MIL-R-39016 in the order shown below:

Ⓔ Insulation resistance, dielectric withstanding voltage, static contact resistance, specified pickup (latch/reset) value (voltage), coil resistance, operate and release time, contact dynamic charcteristics, coil transient suppression (when specified), solderability, seal, visual, and mechanical inspection (external).

Group A testing for relays supplied with spreader pads (-031 through -036), shall be tested as specified below:

Ⓔ Before installation of pad, perform subgroup 2 of group A tests.
Ⓔ After installation of pad, perform subgroups 3 and 4 group A tests.

Qualification inspection (reduced testing) and sample size: See table III. If the relays produced for MIL-R-39016/27 are similar in construction and design except for diodes and headers, as applicable, to the relays produced for MIL-R-39016/28 or MIL-R-39016/30, then reduced testing for qualification of MIL-R-39016/27 relays may be performed concurrent with or subsequent to successful qualification of MIL-R-39016/30.

Ⓔ TABLE III. Qualification inspection (reduced testing).

Examination of test
2 units each coil voltage Group II of qualification inspection table 1 unsealed sample unit for internal examination

SUPERSESSION DATA:

Supersession data: See table IV.

TABLE IV. Supersession data. 1/

Superseded part no. M39016/27-	New part no. M39016/27-	Superseded part no. M39016/27-	New part no. M39016/27-
001	013	007	019
002	014	008	020
003	015	009	021
004	016	010	022
005	017	011	023
006	018	012	024

1/ Dash numbers -013 through -024 are inactive for new design and are for support of existing equipment design only.

Cross reference for Government logistical support: See table V.

TABLE V. Cross reference for Government logistical support.

Superseded part no. M39016/27-	New part no. M39016/27-	Support with part no. M39016/	New part no. M39016/27-	Support with part number M39016/
001	013	27-013	025	27-025
002	014	27-014	026	28-026
003	015	28-015	027	28-027
004	016	28-016	028	28-028
005	017	28-017	029	28-029
006	018	28-018	030	28-030
007	019	27-025	031	27-031
008	020	27-026	032	27-032
009	021	28-027	033	28-033
010	022	28-028	034	28-034
011	023	28-029	035	28-035
012	024	28-030	036	28-036

CONCLUDING MATERIAL

Custodians:
Army - ER
Navy - EC
(E) Air Force - 85

Review activities:
Army - AR
Navy - AS, OSH, SH
(E) Air Force - 99
DLA - ES

User activities:
Navy - MC
(E) Air Force - 11, 19

Preparing activity:
Navy - EC

Agent:
DLA - ES

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